BCT COST TEST

GUIDANCE

September 30, 1980

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BCT Cost Test

I. INTRODUCTION

Sections 301(b)(2)(E) and 304(b)(4)(A) of the Clean Water Act of 1977 (CWA) provide for the establishment of effluent limitations for the conventional pollutants as defined pursuant to section 304(a)(4) of the CWA. Such effluent limitations must be based on the application of the best conventional pollutant control technology (BCT).

Section 304(b)(4)(B) requires a candidate BCT treatment to be compared to treatment by publicly owned treatment works (POTWs) on the basis of the cost of effluent reduction for conventional pollutants. The comparison between POTW removal costs for conventional pollutants and industrial removal costs must be performed whenever effluent limitations for conventional pollutants are established without the use of promulgated effluent limitations guidelines. The Agency developed a methodology for making this comparison during its review of the effluent guidelines for the conventional pollutants in the secondary industries. This review was conducted to determine if existing BAT effluent limitations for conventional pollutants for secondary industries were "reasonable" and thus equivalent to BCT limitations. The results of that review and a discussion of the methodology were published in the Federal Register on August 29, 1979 (44 FR 50732) (Appendix G). The purpose of this guidance is to supplement that discussion for application of the BCT Cost Test when final effluent limitations guidelines are unavailable.

The methodology for assessing the reasonableness of a BCT level of treatment involves comparing the cost per pound of conventional pollutants removed by a BCT treatment for a category or class of industrial dischargers with the cost per pound for POTWs. During the secondary industry review the Agency calculated a common cost ratio (dollars per pound removed) for POTWs which will be used in an updated form in this guidance. The second ratio, the cost per pound removed for industrial dischargers, must be calculated by the permit writer. Once both ratios are available and are expressed in dollars for the same time period (e.g., 2nd quarter, 1979), the comparison can be made.

If the ratio (dollars per pound removed) for the industrial discharger exceeds the POTW ratio, the treatment option under consideration fails the reasonableness test and cannot be used as a basis for BCT effluent limitations for that discharger. If the industrial ratio is less than the POTW ratio, the treatment is an acceptable candidate on which to base BCT effluent limitations.

As was noted in the discussion in the Federal Register on August 29, 1979 (page 50734), the BCT effluent limitations should be based on the most stringent technology which passes the BCT Cost Test. This may involve performing the BCT Cost Test for several treatment options to determine which one of the options which pass the Test produces the most stringent limitations.

II. ROUTINE FOR CALCULATION

To perform the BCT cost test the permit writer must go through four steps.

A. Calculate the incremental annual cost associated with the treatment option under consideration.

B. Compute the incremental annual removal (in pounds) of conventional pollutants achieved by that treatment option.

C. Calculate the cost per pound removed (the industrial cost ratio).

D. Compare the industrial cost ratio with the POTW cost ratio.

A. Incremental Annual Cost

The incremental annual cost is the increase in cost, above the cost of the BPT level of treatment, which is due to the BCT treatment option. This increment includes the annual share of capital expenditures and the annual operating and maintenance costs.

The incremental annual cost is calculated in the following four stages.

1. Determine the annual incremental operating and maintenance (O&M) cost. As much as feasible, this cost should reflect the increase in O&M costs associated with the BCT treatment option being evaluated. The O&M cost should include such elements as labor, materials, chemicals and power.

2. Decide the total capital expenditure attributable to the BCT option. (If the capital expenditure is

already expressed in terms of an annual share, proceed to stage four.)

3. Multiply the total capital expenditure by a capital recovery factor of 22.4% (.224) to calculate the annual share of capital expenditures. The capital recovery factor expresses the annual share of the total capital expenditure which a firm must produce in revenues to pay for the pollution control investment. (For a further explanation of the capital recovery factor, see Appendix A.)

4. Add the annual incremental operating and maintenance cost to the annual share of capital expenditures to produce the incremental annual cost.

B. Incremental Annual Removal

The second figure needed to calculate the industrial cost ratio is the incremental annual removal of conventional pollutants. This figure is the difference between the removal of conventional pollutants achieved by BPT level of treatment and that achieved by the BCT candidate treatment. It is calculated in the following five steps.

1. Select the proper conventional pollutants from Table 1 below (p.5);

2. Subtract the proposed BCT allowable discharge level (expressed as lbs/1,000 lbs or in similar units of production) from the BPT allowable

discharge level for each of the pollutants selected in step (1). (For situations involving concentration-based limits see Appendix C).

3. Add the numbers produced in step (2).
4. Calculate the annual production of the plant. This production figure should be expressed in units compatible with the allowable discharge levels (e.g., if the discharge levels are in lbs/1,000 lbs, then the production figure should be in thousands of pounds);
5. Multiply the number from step (4) by the number from step (3) to yield the incremental annual removal.

C. Industrial Cost Ratio.

To calculate the industrial cost ratio, the permit writer now should divide the incremental annual cost by the incremental annual removal.

TABLE 1

Pollutants Regulated	Pollutants considered in Industrial Calculation
BOD_5	BOD_5
BOD_5 and TSS	BOD_5 and TSS
BOD_5, Oil and Grease	BOD_5[1/] or Oil and Grease
TSS	TSS
TSS, Oil and Grease	TSS, Oil and Grease
TSS, BOD_5, Oil and Grease	TSS, BOD_5 (or Oil and Grease[1/])
Oil and Grease	Oil and Grease

1/ EPA will use the one pollutant (BOD_5 or oil and grease) which has the most incremental removal.

D. Comparison of Cost Ratios.

The industrial ratio is then compared to the proper POTW ratio from Appendix D to evaluate the reasonableness of the proposed BCT effluent limitation.

III. CAVEATS AND SPECIAL CONDITIONS

To perform the BCT Cost Test properly, a number of factors should be kept in mind. First, it is necessary to express both the industrial ratio and the POTW ratio in dollars of the same time period, such as third quarter 1979, in order to make the proper comparison. For this purpose Appendix D is used to select the proper POTW cost ratio. In the event that the industrial cost ratio is expressed in dollars for a period which is not represented in the table in Appendix D, the procedure outlined in Appendix E is used to convert the industrial cost ratio to dollars for the same period as that of the POTW ratio.

Second, 30-day average BPT and BCT limitations should be used to calculate the incremental removal of the conventional pollutants. When only daily maximum BPT limitations are available, daily maximum limitations should be used for both BPT and BCT to calculate the removal.

Third, some reasonable measure of the actual production of a facility should be used in the calculation of the incremental annual removal of conventional pollutants. This calculation should be made in accordance with the directions for arriving at production-based limitations described in section 122.63(b)(2) of the Consolidated Permit Regulations (45 FR 33451, May 19, 1980). These directions are contained in Appendix F.

Fourth, the BCT Cost Test requires that the performance of a treatment option be measured against the baseline of BPT. Ordinarily, the BPT limitations in an applicant's existing permit will be based on promulgated guidelines for BPT and those permit limitations should be used to perform the Test. When the limitations in the existing permit were based on best engineering judgement in the absence of promulgated guidelines, the permit limitations should be used to perform the Test. If the existing permit contains water quality based limitations which are more stringent than BPT limitations, the water quality based limitations should be used to conduct the test. Finally, if an applicant is able to establish that it is performing significantly and consistently better than the BPT limitations in its permit, that performance can be used to perform the Test. An applicant could establish such performance by submitting discharge monitoring data for the previous year.

IV. SOURCES OF INFORMATION

In assembling the information necessary for performing the BCT Cost Test, a number of data sources are available. The appropriateness of each source will vary from application to application. The sources selected should have effluent limitation information or cost data which reflect the conditions in the facility under review and in the relevant point source category.

Among the sources of information are those listed below. The sources can be used singly or in combination.

A. BPT limitations for conventional pollutants

1. from BPT permits for similar facilities (where there is no existing permit) or from the previous best engineering judgment (BEJ) permit of the applicant.

2. from the BPT Development Document in the relevant industrial category or subcategory.

B. BCT limitations

1. from the BPT Development Document which includes the BCT option under consideration for the test.

2. from the draft BAT Development Documents.

3. from the Treatability Manual.

C. Incremental BCT Cost

1. from BPT Development Documents.

2. from draft BAT Development Documents.

3. from economic impact analyses for effluent guidelines.

4. from the Treatability Manual, Volume IV.

In using the Treatability Manual as a data source in connection with the BCT Cost Test, several factors must be recognized. First, the Treatability Manual may not contain all the information on proposed or promulgated BCT effluent limitations. To obtain such information permit writers may need to consult additional sources of informaton. An example of how the Manual may be used to help develop effluent limitations is discussed in Volume V, Section 3 of the Manual.

Second, the cost figures given in Volume IV of the Manual represent the capital and operating costs of various treatment technologies and systems, but these cost figures are

not expressed in incremental terms for the different levels of treatment (i.e., BPT, BCT, and BAT). No mechanism currently exists for extracting automatically from the Manual the incremental costs associated with a particular level of treatment.

V. SAMPLE CALCULATION

INDUSTRY: Sugar Processing

Subcategory: Liquid Cane Sugar Refining

Model Plant: Typical

A. Calculate the incremental annual cost

1. BCT technology is BPT plus recycle of barometric condenser cooling water and activated sludge for blowdown (DD p. 130). Total annual BCT Cost is $265,000. (Development Document (DD), p. 133).

2. BPT technology is impoundment of mud (or dry hauling filter cake), demisters, external separators, and activated sludge (DD, p. 129-30). Total annual BPT cost is $230,000 (DD, pg. 133).

3. Incremental Annual Cost is [(1)-(2)] $35,000. (August 1971 dollars).

B. Compute the incremental annual removal

4. Daily Production: 560 tons (DD, p. 128)

5. Days of Production: 250 (DD, p. 108)

6. Annual Production [(4)x(5)]: 140,000 tons

	BOD	TSS	Total	
7. BPT Allowable Discharge: (DD, p.6-7)(lbs/unit of production)	.63	.33	.96	
8. BCT Allowable Discharge:	.30	.06	.36	
9. Incremental Removal [(7)-(8)]:	.33	.27	.60	lbs./ton

10. Incremental annual removal [(9)x(6)]: 84,000 lbs.

C. Calculate the cost per pound removed

11. Incremental cost/pound [(3)/(10)]: $.42/lb. (August 1971 dollars)

D. Compare the industrial cost ratio with the POTW cost ratio.

12. To complete the test the figure from step 11 would have to be adjusted by the procedure in Appendix E.

Following the Appendix E procedure, the industrial cost ratio of $.42/lb. should be multiplied by a factor of 1.51, which was calculated using the table in Appendix E. The product which results, $.63/lb., expresses the industrial cost ratio in third quarter 1976 dollars. This adjusted industrial cost ratio can then be compared to the POTW cost ratio for the same period, $1.15/lb. Because the industrial cost ratio is less than the POTW cost ratio, the BCT treatment option under consideration is an acceptable basis for effluent limitations for conventional pollutants.* However, if there are treatment options which provide more effective removal of conventional pollutants, the BCT effluent limitations should be based on the option which produces the most effective removal and passes the BCT Cost Test.

SOURCE: DD -- Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Cane Sugar Refining Segment of the Sugar Processing Point Source Category EPA-440/1-74-002-c

*Although the treatment option used in this sample calculation passes the BCT Cost Test when data from the development document are used, the guideline for the liquid cane sugar subcategory was withdrawn for further study because of more recent information on the industry provided to EPA by the sugar processing industry.

Appendix A

THE CAPITAL RECOVERY FACTOR

A. Background

The capital recovery factor (CRF) is a device for expressing capital expenditures on an annual basis. EPA uses a CRF to convert pollution control capital costs into annual costs.

The CRF specifies the percentage of total capital costs which a firm would incur on an annual basis and it reflects the effects of interest, depreciation and taxes. In financial terms the CRF represents the additional revenue required by a firm each year to recover fully the costs of a capital investment. For example, a CRF of 20% implies that every dollar of capital investment requires additional annual revenue of 20 cents for the lifetime of the capital goods to leave the firm as well off as it would be without the pollution control investment.

B. Calculation

EPA recommends that a CRF of 22.4% be used in those circumstances in which capital costs are not already expressed on an annual revenue basis. This CRF is calculated in the following fashion.

1. The formula is

$$CRF = \frac{i(1+i)^n}{(1-t)((1+i)^n-1)} - \frac{1}{n} \times \frac{t}{(1-t)}$$

in which

i = after tax weighted cost of capital

n = lifetime in years of the capital goods

t = marginal tax rate

2. In calculating i an equity/debt ratio of 71.3/28.7 is being used. The after tax cost of equity is 15.4%. The source for both figures is the Quarterly Financial Report published by the Federal Trade Commission. The equity/debt ratio is the average of the ratios for all manufacturing corporations for the 12 quarters from second quarter 1977 through first quarter 1980 and the cost of equity is for all manufacturing corporations for the same time period. The before tax cost of debt for the calculation is 9.9%, which is the average of the all manufacturing cost for the 36 months from July 1977 through June 1980 from Moody's Bond Record, which is published monthly by Moody's Investors Service.

3. Calculating the after tax weighted cost of capital by using the figures from step two produces the following result.

71.3% equity	x	15.4%	cost of equity	= 10.98%
28.7% debt	x	9.9%	cost of debt x (1-.5 (marginal tax rate))	= 1.42%
				12.40%

4. Using a marginal tax rate of 50% and a lifetime for capital goods of 20 years, the capital recovery factor is calculated as follows:

$$CRF = \frac{.124\ (1.124)^{20}}{(1-.5)((1.124)^{20}-1)} - \frac{1}{20} \times \frac{.50}{1-.50}$$

CFR = 22.4%

C. Underlying Assumptions and Sensitivity Analysis

The formula for calculating the CRF was selected because it takes into account the effects of interest, depreciation, and taxes when it expresses the annual share of capital costs. A number of other methods for calculating the annual capital share were suggested in comments on the draft guidance. However, those methods did not incorporate the effects of interest, depreciation, and taxes on the CRF. Because of this shortcoming, those methods were not selected for the CRF calculation.

In calculating the after tax weighted cost of capital, the Quarterly Financial Report and Moody's Bond Record were selected as regular, reliable sources of information about the equity/debt ratio, the after tax cost of equity and the before tax cost of debt. Averages for 12 consecutive quarters (equity/debt ratio and cost of equity) or for 36 consecutive months (cost of debt) were calculated to obtain stable long-term indicators for each of the components of the weighted cost of capital.

The lifetime of capital goods for industrial pollution control equipment of 20 years was selected as representative of the average lifetime of such equipment after consultation with the Effluent Guidelines Division and consideration of the data in the Treatability Manual. The marginal tax rate of 50% is for both federal and state taxation. In almost all cases a marginal tax rate of 50% is greater than the actual marginal rate faced by corporations.

A sensitivity analysis was conducted to determine the impact that varying each of the terms would have on the capital recovery factor. The impacts are represented in the table below.

Sensitivity Analysis

Variable	Variable Values		CRF	
Cost of Debt	8%	12%	.22	.23
Cost of Equity	12.5%	17.5%	.19	.25
Equity/Debt Ratio	65/35	75/25	.21	.23
Equipment Lifetime	15	25	.23	.22
Marginal Tax Rate	46%	54%	.21	.25

As the table shows, variation in the cost of debt, in the equity/debt ratio, or in equipment lifetime has a minimal effect on the CRF value. Only when the marginal tax rate is increased to 54% (an extremely unlikely occurrence) does the CRF change significantly due to that factor. The largest impact is produced by varying the cost of equity. A change of nearly 20% in the cost of equity is required to modify the CRF by 15%.

In conclusion, EPA recommends that the CRF of 22.4% be used to calculate annual capital costs when only total capital costs are available. Only when the value for one or more of the variables for an industrial point source category lies outside the range of values listed in the table above should consideration be given to calculation of a different CRF. If it is concluded that calculating a different CRF is desirable because the point source category under consideration has significantly different financial characteristics, the Quarterly Financial Report can be consulted to adjust the cost of equity

or the equity/debt ratio. However, it will be considerably more difficult to adjust the other factors (cost of debt, service lifetime, marginal tax rate) on a category-specific basis.

Appendix B

BCT Work Sheet

Facility Name _____

NPDES # _____

Guideline(s) _____

General Information

1. Description of Industry
2. Daily Production ----------
3. Days of Production per year ----------
4. Comments

A. Calculation of Incremental Cost

1. BPT Technology

2. Determine Technology to go from BPT to BCT

   a. Source of Information

   b. Technology

3. Determine Cost

   a. Source of Cost Information

   b. Cost Calculation for BCT Technology

      Capital Cost for 19__ ----------

      Annual Cost ----------
      Capital Cost X Capital Recovery Factor (see Appendix A)

      O & M Cost for 19__ ----------

      Total Annual Cost =

      (Annual capital cost + O & M cost)

B. Determination of Annual Pounds Removed

a. Pollutants (selected from Table 1 in Guidance)

	Pollutant (1)	Pollutant (2)	Totals
b. BPT Source			
BPT allowable pounds			
c. BCT Source			
BCT allowable pounds			

BPT Allowable Discharge
Pounds/unit of production (daily avg.) - - - - - - - - - - -

BCT Allowable Discharge
Pounds/unit of production - - - - - - - - - - - - - - - - - - _____

Incremental Removal (difference between BPT and BCT) - - -

Pounds removed per year =

(Daily Production) X (Days of Production per Year) X (Incremental Removal)

C. Determine Cost per Pound Removed

$$\frac{\text{Total Annual Cost}}{\text{Pounds removed per year}} = \text{cost/pound removed}$$

D. Compare the industrial cost ratio with cost of pollutant removal for POTWs.

1. Select the POTW cost figure from the table in Appendix D which corresponds to the time period from which the BCT technology cost figures were derived.

2. If the BCT cost figures are for a period other than those listed in Appendix D, use the technique described in Appendix E to adjust the industrial cost ratio to the proper time period.

Appendix C
Calculation of Removal When Effluent Limitations Are Expressed in Terms of Concentration

BPT limits are generally available in units related to production, but some may be expressed in concentration only. A candidate BCT treatment method usually defines an effluent concentration for the conventional pollutant of interest. A method for converting this concentration to units compatible with the BPT production based limits is described below.

1. Select the proper conventional pollutants from Table 1 in the Guidance.

2. Calculate the annual plant production.

3. Calculate the allowable BPT discharge load for each pollutant from appropriate BPT effluent limits and production figures. (If no change in plant processes or production, this will be the previous permit BPT limits.)

4. Determine the BCT candidate treatment and the expected effluent concentration for each pollutant.

5. Calculate the BCT expected discharge load for each pollutant from the effluent concentrations and flow rate (using design average flow).

6. Calculate the incremental annual removal of each pollutant by subtracting the loads found in Step 5 from the loads found in Step 3. Then add the loads for each pollutant selected in Step 1.

Appendix D

POTW Cost Ratio

Cost of Pollutant Removal for POTWs
(per pound removed)

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1974	$0.95	$1.01	$1.09	$1.10
1975	$1.06	$1.03	$1.05	$1.06
1976	$1.10	$1.14	$1.15	$1.17
1977	$1.18	$1.20	$1.25	$1.26
1978	$1.27	$1.30	$1.34	$1.41
1979	$1.44	$1.47	$1.49	$1.52
1980	$1.56	$1.57	—	—

The cost ratios in the above table were calculated in accordance with the formulas contained in Appendix B of the August 29, 1979 Federal Register publication on the BCT Cost Test (44 F.R. 50732, 50749) (see appendix G). The table can be extended to the third quarter, 1980 and beyond by using the same formulas and by obtaining the proper cost indexes as they become available. These indexes are the large city advanced treatment (LCAT) and small city conventional treatment (SCCT) construction cost indexes and the operation and maintenance escalation index. All three indexes are published on a quarterly basis by the Facility Requirements Division of the Office of Water Program Operations of EPA (FTS 426-9404).

Appendix E

Industrial Cost Adjustment

Under those circumstances in which the incremental BCT costs are for a time period, such as second quarter 1972, which is not covered by the table in Appendix D, the industrial cost ratio must be adjusted so that it can be compared to the POTW cost ratio. To make the adjustment, the following procedure should be followed.

1. Select the index for the time period in which the cost of the BCT level of treatment is expressed from the table below (page 4).

2. Divide the index for September 1976 (2465) by the index selected in step one.

3. Multiply the quotient from step two by the industrial cost ratio which is developed in steps A, B, and C of the procedure outlined in the guidance (see pages 3-5).

4. Compare the product from in step three to the POTW cost ratio for the third quarter 1976 ($1.15) to determine if the proposed BCT Treatment is reasonable.

Example:

If industrial BCT costs are expressed in August 1971 dollars, the procedure is:

1. Select the proper index (August 1971) from the table below (page 4) - 1629.

2. Divide the index for September 1976 (2465) by the index from step one (1629) -- 1.51
3. Multiply the industrial cost ratio from step C of the guidance (page 5) by 1.51.
4. Compare the result in step three with $1.15. If the idustrial cost ratio from step three exceeds $1.15, the treatment option is unacceptable as a basis for BCT effluent limitations.

The Engineering News Record (ENR) Construction Cost Index, with 1913 as the base year, was selected to adjust industrial pollution control costs for the BCT Cost Test after considering a number of alternative. The ready availability and frequency of updating were important considerations. Among the other indexes considered were (1) the pollution Abatement an Control Expenditures index (Department of Commerce); (2)the Department of Commerce Composite index; and, (3) the Chemical Engineering cost index. The first index, which is the index most directly related to the purposes of the Test, currently appears only on an annual basis. The second index is based on more than a dozen construction cost indexes, only some of which are directly related to pollution control costs. The third index was not selected because it is industry-specific (the chemical industry) and the Test has to be applied to a range of industries.

The ENR national Costruction Cost Index with 1913 as the base year was selected rather than the ENR index with a 1967 base for two reasons. The 1913 index is available for earlier time

periods than the 1967 index (before 1972). In addition, the costs in the Treatability Manual are indexed in terms of the 1913 index.

Construction Cost Index History
Engineering News Record
March 20, 1980

1913 = 100 Monthly

	Jan.	Feb.	Mar	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Average
1962	855	858	861	863	872	873	877	881	881	880	880	880	872
1963	883	883	884	885	894	899	909	914	914	916	914	915	901
1964	918	920	922	926	930	935	945	948	947	948	948	948	936
1965	948	957	958	957	958	969	977	984	986	986	986	988	971
1966	988	997	998	1006	1014	1029	1031	1033	1034	1032	1033	1034	1019
1967	1039	1041	1043	1044	1059	1068	1078	1089	1092	1096	1097	1098	1070
1968	1107	1114	1117	1124	1142	1154	1158	1171	1186	1190	1191	1201	1155
1969	1216	1229	1238	1249	1258	1270	1283	1292	1285	1299	1305	1305	1269
1970	1309	1311	1314	1329	1351	1375	1414	1418	1421	1434	1445	1445	1385
1971	1465	1467	1496	1513	1551	1589	1618	1629	1654	1657	1665	1672	1581
1972	1686	1691	1697	1707	1735	1761	1772	1777	1786	1794	1808	1816	1753
1973	1838	1850	1859	1874	1880	1896	1901	1901	1902	1933	1935	1939	1895
1974	1940	1940	1940	1961	1961	1993	2040	2076	2089	2100	2094	2101	2020
1975	2103	2128	2128	2135	2164	2205	2248	2274	2275	2293	2293	2297	2212
1976	2305	2314	2322	2327	2357	2410	2414	2445	2465	2478	2486	2490	2401
1977	2494	2505	2513	2514	2515	2541	2579	2611	2644	2675	2659	2660	2577
1978	2672	2681	2693	2698	2733	2753	2821	2829	2851	2851	2861	2869	2776
1979	2872	2877	2886	2886	2889	2984	3052	3071	3120	3122	3131	3140	3003
1980	3132	3134	3159	3051	3139	3198	3260						

The above table can be updated by referring to the Market Trends section of the Engineering News Record

owned treatment works, in accordance with any applicable regulations.

(p) *Coast Guard.* When a permit is issued to a facility that may operate at certain times as a means of transportation over water, a condition that the discharge shall comply with any applicable regulations promulgated by the Secretary of the department in which the Coast Guard is operating, that establish specifications for safe transportation, handling, carriage, and storage of pollutants.

(q) *Navigation.* Any conditions that the Secretary of the Army considers necessary to ensure that navigation and anchorage will not be substantially impaired, in accordance with § 124.58.

§ 122.63 Calculating NPDES permit conditions.

(Applicable to State NPDES programs, see § 123.7.)

(a) *Outfalls and discharge points.* All permit effluent limitations, standards, and prohibitions shall be established for each outfall or discharge point of the permitted facility, except as otherwise provided under § 122.62(k)(2) (BMPs where limitations are infeasible) and paragraph (i) of this section (limitations on internal waste streams).

(b) *Production-based limitations.* (1) In the case of POTWs, permit limitations, standards, or prohibitions shall be calculated based on design flow.

(2) Except in the case of POTWs, calculation of any permit limitations, standards, or prohibitions which are based on production (or other measure of operation) shall be based not upon the designed production capacity but rather upon a reasonable measure of actual production of the facility, such as the production during the high month of the previous year, or the monthly average for the highest of the previous 5 years. For new sources or new dischargers, actual production shall be estimated using projected production. The time period of the measure of production shall correspond to the time period of the calculated permit limitations; for example, monthly production shall be used to calculate average monthly discharge limitations.

(c) *Metals.* All permit effluent limitations, standards, or prohibitions for a metal shall be expressed in terms of the total metal (that is, the sum of the dissolved and suspended fractions of the metal) unless:

(1) An applicable effluent standard or limitation has been promulgated under CWA and specifies the limitation for the metal in the dissolved or valent form; or

(2) In establishing permit limitations on a case-by-case basis under § 125.3, it is necessary to express the limitation on the metal in the dissolved or valent form in order to carry out the provisions of CWA.

(d) *Continuous discharges.* For continuous discharges all permit effluent limitations, standards, and prohibitions, including those necessary to achieve water quality standards, shall unless impracticable be stated as:

(1) Maximum daily and average monthly discharge limitations for all dischargers other than publicly owned treatment works; and

(2) Average weekly and average monthly discharge limitations for POTWs.

(e) *Non-continuous discharges.* Discharges which are not continuous, as defined in § 122.3, shall be particularly described and limited, considering the following factors, as appropriate:

(1) Frequency (for example, a batch discharge shall not occur more than once every 3 weeks);

(2) Total mass (for example, not to exceed 100 kilograms of zinc and 200 kilograms of chromium per batch discharge);

(3) Maximum rate of discharge of pollutants during the discharge (for example, not to exceed 2 kilograms of zinc per minute); and

(4) Prohibition or limitation of specified pollutants by mass, concentration, or other appropriate measure (for example, shall not contain at any time more than 0.1 mg/l zinc or more than 250 grams (1/4 kilogram) of zinc in any discharge).

(f) *Mass limitations.* (1) All pollutants limited in permits shall have limitations, standards, or prohibitions expressed in terms of mass except:

(i) For pH, temperature, radiation, or other pollutants which cannot appropriately be expressed by mass;

(ii) When applicable standards and limitations are expressed in terms of other units of measurement; or

(iii) If in establishing permit limitations on a case-by-case basis under § 125.3, limitations expressed in terms of mass are infeasible because the mass of the pollutant discharged cannot be related to a measure of operation (for example, discharges of TSS from certain mining operations), and permit conditions ensure that dilution will not be used as a substitute for treatment.

(2) Pollutants limited in terms of mass additionally may be limited in terms of other units of measurement, and the permit shall require the permittee to comply with both limitations.

(g) *Pollutants in intake water.* Except as provided in paragraph (h) of this section, effluent limitations imposed in permits shall not be adjusted for pollutants in the intake water.

(h) *Net limitations.* (1) Upon request of the discharger, effluent limitations or standards imposed in a permit shall be calculated on a "net" basis; that is, adjusted to reflect credit for pollutants in the discharger's intake water, if the discharger demonstrates that its intake water is drawn from the same body of water into which the discharge is made and if:

(i)(A) The applicable effluent limitations and standards contained in 40 CFR Subchapter N specifically provide that they shall be applied on a net basis; or

(B) The discharger demonstrates that pollutants present in the intake water will not be entirely removed by the treatment systems operated by the discharger; and

(ii) The permit contains conditions requiring:

(A) The permittee to conduct additional monitoring (for example, for flow and concentration of pollutants) as necessary to determine continued eligibility for and compliance with any such adjustments; and

(B) The permittee to notify the Director if eligibility for an adjustment under this section has been altered or no longer exists. In that case, the permit may be modified accordingly under § 122.15.

(2) Permit effluent limitations or standards adjusted under this paragraph shall be calculated on the basis of the amount of pollutants present after any treatment steps have been performed on the intake water by or for the discharger. Adjustments under this paragraph shall be given only to the extent that pollutants in the intake water which are limited in the permit are not removed by the treatment technology employed by the discharger. In addition, effluent limitations or standards shall not be adjusted to the extent that the pollutants in the intake water vary physically, chemically, or biologically from the pollutants limited in the permit. Nor shall effluent limitations or standards be adjusted to the extent that the discharger significantly increases concentrations of pollutants in the intake water, even though the total amount of pollutants might remain the same.

(i) *Internal waste streams.* (1) When permit effluent limitations or standards imposed at the point of discharge are impractical or infeasible, effluent limitations or standards for discharges of pollutants may be imposed on internal waste streams before mixing with other waste streams or cooling water streams. In those instances, the

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 405, 406, 407, 408, 409, 411, 412, 418, 422, 424, 426, 427, 432

[FRL 1335-1]

Best Conventional Pollutant Control Technology; Reasonableness of Existing Effluent Limitation Guidelines

AGENCY: Environmental Protection Agency.

ACTION: Final rules.

SUMMARY: EPA publishes the results of its review of effluent limitations on conventional pollutants in certain industries. In some industries, effluent limitations representing "best conventional pollutant control technology" (BCT) are promulgated. These limitations will replace limitations representing "best available technology economically achievable" (BAT) previously established for conventional pollutants. In other industries, BAT limitations on conventional pollutants are withdrawn, and BCT limitations will be promulgated at a later date.

EPA initially proposed BCT limitations on August 23, 1978. At that time, the public was invited to comment on the proposed regulations, and a public meeting was held. The comments received from the public have all been reviewed and evaluated by EPA. They have been incorporated into this final rulemaking package.

DATE: The effective date of these regulations will be September 28, 1979.

FOR FURTHER INFORMATION CONTACT: Ms. Emily Hammond, Office of Analysis and Evaluation (WH-586), EPA, 401 M Street S.W., Washington D.C. 20460, 202-755-2484.

SUPPLEMENTARY INFORMATION:

1. Background

Legal Basis

On August 23, 1978, EPA published proposed "best conventional pollutant control technology" (BCT) for selected industries. The proposed regulations were developed in response to Section 304(b)(4)(B) of the 1977 Amendments to the Clean Water Act (CWA). Section 304(b)(4)(B) instructs EPA to determine BCT through an analysis of:

> The reasonableness of the relationship between the costs of attaining a reduction in effluents and the effluent reduction benefits derived, and the comparison of the cost and level of reduction of such pollutants from the discharge of publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources.

The Act also specifies that additional consideration be given in making BCT determinations to the age of equipment, production process, energy requirements, and other appropriate factors.

BCT is not an additional effluent limitation for industrial dischargers, but rather it replaces "best available technology economically achievable" (BAT) for the control of conventional pollutants. BAT will remain in force for all non-conventional and toxic pollutants. Effluent limitations representing BCT may not be more stringent than BAT. However, BCT, like BAT, is subject to periodic review, and progress in waste treatment technology may warrant subsequent revision. In no case will BCT limitations be less stringent than limitations representing "best practicable technology currently available" (BPT).

Section 73 of the CWA of 1977 directs the Agency to review, immediately, all existing final or interim final BAT effluent guidelines for conventional pollutants in those industries not covered in the Settlement Agreement reached in *NRDC v. Train*, 8 ERC 2120 (D.D.C. 1976). These industries are often referred to as "secondary industries." This review was to be completed within 90 days of enactment of the Act.

2. Industries Covered by This Review

As directed by Congress, EPA has evaluated all BAT regulations for conventional pollutants which apply to industries not covered by the NRDC Settlement Agreement (those not listed in Table 1 of Committee Print No. 95-30 of the Committee on Public Works and Transportation of the House of Representatives). Thirteen secondary industry categories have final or interim final BAT effluent guidelines. These are listed in Tables 1 and 2. Complete analysis has not been carried out on all of the subcategories in these industries. In those cases where conventional pollutant BAT limitations are equivalent to BPT, no further analysis is necessary. Since BPT constitutes a floor below which BCT may not be established, all BAT limitations set at that point are reasonable, and are being promulgated as BCT. The 20 subcategories which fall into this group are listed in Table 1.

The 93 subcategories in Table 2 were studied further. Of the 93 subcategories, BAT regulations for 45 are not finally promulgated or are withdrawn for a variety of other reasons. BCT limitations will be set at a later date, and BPT alone will remain in effect. In some instances, industry studies currently underway are expected to result shortly in the necessary data to establish new standards (the seafoods industry, the cane sugar subcategories of the sugar processing industry, and three subcategories in the fruit and vegetable processing industry). In other instances, data submitted by industry warrants further consideration (four subcategories in the meat processing industry, the beet sugar subcategory of the sugar processing industry, the frozen potato subcategory, and parts of the condensed milk and condensed whey subcategory). Adequate information is not currently available on industry operations to conduct the necessary analysis for duck feedlots. In a final case, some limitations in certain meat products subcategories have been remanded by a court for reconsideration, and BPT will be set at the conclusion of that process.

EPA expects to use the methodology employed in this BCT review when an analysis of conventional pollutant treatment requirements is conducted for the primary industries (those industries to be covered by the Consent Agreement). National BCT limitations will be proposed and promulgated along with BAT, pretreatment, and new source standards. The explicit application of the BCT methodology to each industry will be detailed at the time each regulation is proposed.

3. Pollutants Covered by the Review

Section 304(a)(4) of the Act specifies that conventional pollutants should include, but not be limited to, biochemical oxygen demanding pollutants (BOD5), total suspended solids (TSS), fecal coliform, and pH. The Agency, in a separate action, has designated oil and grease as a conventional pollutant (44 FR 44501, July 30, 1979) and this review of BAT effluent guidelines includes oil and grease in the analysis of reasonableness where appropriate. In the case of both fecal coliform and pH, the BAT regulations under review were in all cases equivalent to BPT regulations. Therefore, no further analysis has been performed on these pollutants, and BCT controls of pH and fecal coliform will be the same as BPT. Consequently, the pollutants considered in this review are BOD5, TSS, and oil and grease. If, at any time, pollutants are added or deleted from the conventional pollutant list, the Agency will reevaluate all effluent guidelines affected by such revisions.

4. Methodology for Determining Reasonableness of BAT Regulations

(a) *Background.* The objective of this review is to evaluate existing BAT limitations for the "secondary" industries to determine if they satisfy the criteria for BCT contained in section 304(b)(4)(B). That section, which requires a consideration of the "cost reasonableness" of effluent limitations for conventional pollutants, has necessitated the development of a wholly new methodology for evaluating existing effluent limitations and for developing subsequent BCT limitations.

In developing the methodology for this regulation, EPA was guided both by the statutory language of section 304(b)(4)(B) and by Congress' underlying objectives in establishing BCT. The legislative history makes it clear that Congress was concerned that requirements for the control of conventional pollutants beyond BPT may, in some cases, be unreasonably expensive. Congress recognized that at some point costs for such control begin to exceed associated "effluent reduction benefits", and thus established BCT to ensure that any limitations controlling conventional pollutants at a level more stringent than BPT were "reasonable"

This regulation satisfies those objectives. The core of the Agency's BCT methodology is a comparison of the costs of removing additional pounds of conventional pollutants for industry with comparable costs of removal for an average publicly owned treatment works (POTW). This cost figure for the POTW constitutes the basic measure of "reasonableness" established by the Act. As Senator Muskie noted:

> The Administrator must determine whether or not the cost of achieving reductions of conventional pollutants bears a reasonable relationship to the amount of effluent reduction achieved. In making this determination, the Administrator is to compare the costs of industrial effluent reduction to the cost of municipal waste treatment.

There are, however, a range of additional factors which are significant in establishing BCT. EPA interprets and applies these factors as follows.

(1) BPT is the base point for evaluation of limitations on conventional pollutants. All costs beyond BPT associated with the control of conventional pollutants are used in the BCT evaluation. No limitation more stringent than BPT can be established as BCT if it fails the cost reasonableness comparison.

(2) Effluent reduction benefits, calculated in terms of additional pounds of conventional pollutants removed, are directly incorporated in the cost per pound comparison.

(3) A uniform measure of reasonableness is established for all industries throughout the country. This ensures that no industry will be required to exceed a specified cost per pound for removal of conventional pollutants. In consequence, industries with high costs for removal of conventional pollutants, in many cases, will be subject to less stringent effluent limitations.

(4) A greater proportion of the total costs for control of conventional pollutants will now be allocated to industries and segments of industries comprised of large facilities. These facilities are able to remove conventional pollutants at the lowest cost.

(5) The final methodology results in the relief which Congress intended for control of conventional pollutants, and resolves the uneven impact of existing BAT limitations. Of the 93 industry subcategories evaluated in detail in this review, 22 have reasonable BAT limitations, 13 have unreasonable limitations, 6 have split determinations depending on the size of plant, 7 are not affected by this review because the BAT limitations in those cases are designed to control toxic pollutants, while the remaining 45 as noted above will require further analysis. For those subcategories in which BAT was found to be unreasonable, or requiring further analysis, EPA will undertake further study to develop appropriate BCT limitations.

These new limitations will result in a substantial reduction in expenditures for control of conventional pollutants. While this regulation covers only secondary industries, when the methodology is applied to the development of BCT limitations for the control of conventional pollutants in the primary industries, substantial additional savings will be realized.

(b) *The BCT Test.* The BCT test compares the cost for industry to remove a pound of conventional pollutants to the cost incurred by a POTW for removing a pound of conventional pollutants. If the industry cost for a specific technology is lower than the POTW cost, the test is passed and the level of control of conventional pollutants is considered reasonable. If the industry costs of removal are higher than the POTW costs, the test is failed, and BCT cannot be set at that level.

In the case of this Section 73 secondary industry review, the BCT test is applied to existing BAT requirements to determine if the existing promulgated regulations are reasonable. If the existing BAT limitation passes the test, BCT is being promulgated as equivalent to the former BAT. If the BAT standard does not pass the test, the existing BAT is being withdrawn until an appropriate BCT can be set.

(1) *Calculation of Industrial Costs:* The incremental annual costs are calculated by determining the difference between the annual costs for a model plant representing an industrial subcategory to achieve BPT and the annual costs to achieve the candidate BCT for conventional pollutants. Annual costs include operation and maintenance expenses, capital costs, and depreciation. The data used by EPA in determining industrial costs for this review are drawn from the Agency Development Documents which were prepared for each of the affected industries (See Appendix A). The data are updated to 1978 dollars, so that they can be compared on a consistent basis.

(2) *Calculation of Industrial Pollutant Removal:* The incremental removal of conventional pollutants is calculated by determining the difference between the annual pounds of conventional pollutants removed after compliance with BPT and the pounds removed after compliance with the candidate BCT. The conventional pollutants subject to this review fall into two categories: suspended solids (TSS), and oxygen-demanding substances (BOD5 and oil and grease). To avoid "double counting" of the amount of pollutants removed, the incremental pounds removed from BPT to candidate BCT are calculated using only one pollutant from each group. In those cases where both BOD5 and oil and grease are subject to limitations, the pollutant with the greater amount of removal is included in the calculation. If a group is not represented in the effluent limitation guideline for the subcategory, then it is not included in the evaluation. Table 3 details the pollutants to be used in the calculation.

(3) *Calculation of the Industrial Ratio:* The ratio of incremental annual costs to incremental conventional pollutant removal is calculated as follows:

(candidate BCT annual costs-BPT annual costs)/(candidate BCT pounds of conventional pollutants removed-BPT pounds of conventional pollutants removed)

This ratio represents the annual incremental cost to remove a pound of conventional pollutants beyond BPT in terms of dollars per pound.

(4) *Calculation of the Industrial Ratios in the Absence of BAT:* For those subcategories in which BAT limitations are unreasonable, and in those subcategories in which BAT has not been promulgated, the Agency will be

considering several candidate technologies for BCT. In evaluating the reasonableness of these candidates, EPA will use BPT as a starting point and determine the incremental costs and levels of pollutant removal from BPT to each of the candidate technologies. BCT will be promulgated based on the most stringent technology option which passes the reasonableness test, as well as the other factors specified in the Act.

(5) *Calculation of POTW Cost-Effectiveness Ratio:* A single cost reasonableness ratio for a POTW of average size was developed for comparison with industrial ratios. This figure was based on the costs of a POTW with a flow of two million gallons per day to upgrade its facility from secondary treatment (30 milligrams per liter (mg/l) of TSS, 30 mg/l of BOD5) to advanced secondary treatment (10 mg/l of TSS, 10 mg/l of BOD5). The resulting POTW cost reasonableness ratio is $1.15 per pound (1976 dollars). This figure will be updated periodically to account for inflation. A detailed discussion of the calculation of the POTW ratio is contained in Appendix B.

(6) *Comparison of Industrial and POTW Ratios:* In order to determine whether or not the industrial regulation under review meets the BCT test, the ratio for the industrial subcategory is compared to the POTW ratio. This single POTW ratio is used for all industrial comparisons. In this review, if the industrial ratio is less than the POTW ratio, then a BCT limitation is promulgated at the BAT level. No further analysis is required. If the industrial ratio is greater than the POTW ratio, then the BAT requirements are determined to be unreasonable and are withdrawn. BCT limitations will be promulgated in such cases after further analysis of alternative, less stringent technologies.

5. Summary of Determinations

Table 4 summarizes the results of the review, and detailed discussion of the determinations for each industrial subcategory is presented in Appendix C.

Based on this review the Agency has determined that the BAT control of conventional pollutants for 22 subcategories are reasonable and BCT for these 22 subcategories are being promulgated as equal to the current BAT guidelines. Most of the subcategories that have been determined to be reasonable are in the Dairy, Grain Mills, and Fruits and Vegetable industries.

Thirteen of the subcategory regulations are judged unreasonable, and consequently, the Agency will withdraw the BAT effluent guidelines for conventional pollutants until the proper levels of control can be determined. Regulations that are unreasonable are found in the Glass and Ferroalloys industries.

There are six industry subcategories where the limitations for one size model plant are reasonable, but unreasonable for another size, or where a portion of the subcategory is withdrawn pending further study. The BCT regulations will only cover the size range of plants where the limitations are reasonable, and exclude those plants where the limits are unreasonable. This was found in the Dairy and Fruit and Vegetable industries.

The Agency is suspending all 28 of the subcategories in the Seafood category. In a separate action, the limitations for these twenty-eight subcategories are being reviewed, and final BCT limitations will be promulgated at a later date.

Also in a separate action, the Agency has agreed with Fruit and Vegetable industry representatives to withdraw the three canned and preserved fruit and vegetable processing subcategories. This notice was published on June 20, 1979, 44 FR 36033 BCT limitations will be promulgated at a later date.

For one subcategory in the Feedlots industry (duck feedlots) the Agency does not have the necessary data to perform the cost test. As a result, the Agency is withdrawing the BAT limitation for the ducks subcategory until further analysis can be performed.

For four Meat industry subcategories (meat packing), portions of the BAT limitations not applying to conventional pollutants have been remanded by the courts. In one of these subcategories, the TSS limitations were also remanded. In response to this remand, these limitations are currently being reviewed. In the interim, the Agency is now withdrawing the remaining BAT limitations for BOD5 and TSS. However, limitations for fecal coliform and pH in these subcategories are being retained because controls of these pollutants are the same at BPT and BAT. In the case of four additional Meat industry subcategories (meat processing), the Agency is conducting a review of the limitations beyond BPT, so BCT is not being promulgated at this time. The final limitations will be promulgated at a later date.

The two regulations for cane sugar refining are currently being reviewed as part of a court stipulation. Therefore, the Agency will not promulgate the final BCT determinations at this time.

Spokesmen for the beet sugar industry, the frozen potato processors, and portions of condensed whey and condensed milk producers have submitted data on costs of BPT level treatment technology and the performance of that technology. On the basis of that data, the Agency wishes to conduct further review of potential limitations for this subcategory, and will not promulgate BCT limitations at this time.

Seven subcategories in the Asbestos industry are not affected by this review. The BAT limitations for these subcategories require that facilities achieve zero discharge of pollutants. These limitations are designed to control the discharge of toxic pollutants and are thus not subject to a BCT analysis.

6. Modifications to the Proposal

Since the publication of the proposed regulations in August of 1978, EPA has been reviewing the regulations in response to comments from the public and to new information that has become available to the Agency. Comments were received from 79 parties including many industrial groups, the Council on Wage and Price Stability, and several State governments. The commenters raised significant concerns with the approach taken by EPA in developing the proposed regulations. The comments fall into two general categories: those pertaining to the overall methodology, including the POTW and industrial calculations; and, those concerning the individual industry data used. Detailed responses to the comments regarding the individual industry data are presented in Appendix C, and responses to the major public comments regarding the overall methodology are presented in Appendix D.

In conjunction with the public comment review, EPA has reevaluated its methodology and its data base and concluded that certain changes in approach are appropriate. The more important modifications in the methodology used by EPA which affect final BCT regulations are described below.

(a) *POTW Cost and Operational Data.* In its initial BCT proposal in developing the POTW cost comparison figure, EPA relied on a document entitled "An Analysis of Cost Experience for Wastewater Treatment Plants." Since that time, EPA has published two new documents, "Construction Costs for Municipal Wastewater Treatment Plants, 1973–77" and "Analysis of Operations and Maintenance Costs for Municipal Wastewater Treatment Systems." These provide more accurate and up-to-date information on municipal treatment costs and hence are more appropriate for use in the POTW-industry comparisons. EPA announced that it was considering the use of these

two documents in a Federal Register notice of April 2, 1979, 44 Fed. Reg. 19214. Appendix B describes in detail how the municipal treatment costs used in the BCT evaluation is derived from the documents. Responses to comments on the April 2 notice are included in Appendix D.

(b) *Using a Single, POTW Cost Reasonableness Figure.* The BCT standards are based on a comparison of industry and POTW treatment costs and levels of removal. In the proposed methodology, industries were compared to POTW's having comparable rates of flow. Costs for these POTW's ranged from $.36 to $1.72 per pound of pollutant removed. This approach resulted in some industries with relatively high treatment costs being judged to have reasonable BAT limitations because they were compared to a POTW with a high cost. Other industries, however, with relatively low costs, were determined to have unreasonable BAT limitations because the POTW they were measured against had low costs. To rectify this inequity, EPA is now employing a single POTW comparison figure based on an average size POTW of 2 mgd. This approach will result in a more "economically efficient" solution. Those subcategories that can cheaply achieve stringent limitations will continue to do so, but for those where it is relatively expensive, some relief will be given. The single cost figure approach has the additional advantage of being far easier to apply. A discussion of the specific calculation of the POTW figure is contained in Appendix B.

(c) *The Concentration Test.* The methodology used by EPA in developing the proposed BCT regulations included a second, "concentration test", that was applied to any industry regulation which did not pass the BCT test. In cases where an industry's effluent had an significantly higher pollutant concentration than a POTW, BAT requirements were retained as BCT. This test was uniformly opposed by commenters, who argued that it discourages water conservation, and is arbitrary and one-sided. EPA agrees, and has decided that the concentration test will not be used in making BCT determinations.

(d) *Calculation of POTW Cost Comparison Figure.* In its initial proposal, EPA calculated its POTW cost comparison figures based on the difference in costs and levels of removal between a POTW constructed to have an effluent of 25 mg/l of BOD, 25 mg/l of TSS and one constructed to achieve 12 mg/l of BOD and 12 mg/l of TSS. The Agency is now calculating the POTW cost comparison figure based on the incremental costs and levels of removal associated with the upgrading of an existing POTW from secondary treatment (30 mg/l BOD, 30 mg/l TSS) to advanced secondary treatment (10 mg/l BOD, 10 mg/l TSS).

Although Congress specifically required a comparison of the "cost and levels of reduction" of conventional pollutants from POTWs with those of industry, nowhere in the Act or its legislative history is there specific direction as to how the POTW cost comparison figure is to be derived. It is clear, however, that the POTW costs are to provide a benchmark for judging the "reasonableness" of industry limitations.

One appropriate measure of POTW costs is the marginal costs of removal at secondary treatment. Although Congress did not state that the secondary treatment level was significant in determining BCT, it is the current legal requirement for most POTWs and the level at which the bulk of existing POTWs are now operating. Calculation of the costs per pound of conventional pollutant removal based on the increment from secondary to advanced secondary yields the best approximation of such marginal costs. Although an increment which narrowly straddles secondary treatment would have been preferable in indentifying marginal costs, adequate data on such an increment do not exist.

In establishing the POTW cost comparison figure, Congress may also have been concerned with identifying the "knee-of-the-curve" for POTW costs and effluent reduction benefits. The Agency has submitted to Congress analyses which indicate that costs for pollution control to achieve pollutant concentrations lower than 10 mg/l of BOD and 10 mg/l of TSS begin to rise sharply in relation to effluent reduction benefits. Essentially, advanced secondary treatment marks the "knee-of-the-curve" with respect to POTW costs. Use of the secondary to advanced secondary increment thus effectively determines the cost per pound to achieve this maximum cost-effective level of control.

Finally, basing the comparison figure on the cost of a POTW to upgrade from secondary to advanced secondary treatment roughly parallels the industrial increment under consideration. Congress, in establishing BCT, was concerned about the reasonableness of the requirement that industry progress from BPT to BAT. Similarly, focusing on the costs to upgrade existing POTWs beyond secondary treatment is appropriate.

In selecting this narrow increment the Agency is aware that the parallel in legal requirements for industry and POTW is not exact. Industries are required to meet BAT, and now BCT, by July 1, 1984. The comparable requirement for POTWs is achievement of "best practicable wastewater treatment technology" ("BPWTT") by July 1, 1983. However, BPWTT has never been precisely defined by EPA, and most POTW's will continue to operate at secondary treatment. Nonetheless, Congress has not modified the obligation of POTWs to achieve more stringent levels. Although concerned with funding of expensive advanced wastewater treatment systems, Congress has continued to fund construction of POTWs at better than secondary levels. EPA has judged that funding for construction of POTWs employing advanced secondary treatment is reasonable, and not subject to special intensified review.

(e) *Calculation of Conventional Pollutant Removal.* EPA originally proposed that if BOD5 and oil and grease were both regulated, only the pounds of BOD5 were to be included in the calculation of the incremental pounds of conventional pollutants removed. This has been modified and where both are regulated, the pollutant with the greater amount of removal will be included in the calculation. The Agency feels that the total effluent reduction benefits are best identified by using the pollutant in a given category which has the greater amount of removal in the calculation. However, a single pollutant in a category will continue to be used in the calculation because of the difficulty of allocating costs of removal between pollutants.

Additionally, total phosphorus and chemical oxygen demand were proposed as conventional pollutants, and they were included in the Agency's proposed BCT methodology. However, the proposal to designate these pollutants a conventional has been withdrawn, and they have been excluded from consideration in this rulemaking.

7. Information Available

Copies of the Federal Register notice can be obtained, without charge, by contacting: Sandra Jones, Environmental Protection Agency, 401 M Street, S.W. (WH-586), Washington, D.C. 20460, 202-426-2617.

The costs and pollutants removal data used in this review are taken from the development documents and economic analyses that were published in the development of BAT guidelines. The documents are available for public inspection at all EPA regional libraries

this subpart after application of the best conventional technology pollutant control technologyn

Effluent characteristics	Effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed
	(Metric units) kg/1000 kg of finished product	
BOD5	0.11	0.05
TSS	0.22	0.11
Oil & grease	0.10	0.05
pH	Within the range 6.0 to 9.0	
Fecal coliforms	Maximum at any time 400 mpn/100 ml	
	(English units) lb/1,000 lb of finished product	
BOD5	0.11	0.05
TSS	0.22	0.11
Oil & grease	0.10	0.05
pH	Within the range 6.0 to 9.0	
Fecal coliforms	Maximum at any time 400 mpn/100 ml	

(b) The limitations given in paragraph (a) of this section for BOD5 and TSS are derived for a renderer which does no cattle hide curing as part of the plant activities. If a renderer does conduct hide curing, the following empirical formulas should be used to derive an additive adjustment to the effluent limitations for BOD5 and TSS.

BOD5 Adjustment (kg/kkg RM) = 3.6 × (number of hides) / kg of raw material

(for 1,000 lb RM) = 7.9 × (number of hides) / lbs of raw material

TSS Adjustment (kg/kkg RM) = 5.2 × (number of hides) / kg of raw material

(for 1,000 lb RM) = 13.6 × (number of hides) / lbs of raw material

10. The new sections listed below are added as follows:

§ —— Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best conventional pollutant control technology.

The following limitations establish the quantity or quality of pollutants or pollutant properties, controlled by this section, which may be discharged by a point source subject to the provisions of this subpart after application of the best conventional pollutant control technology:

Effluent characteristic	Effluent limitations
Fecal coliform	Maximum at any time 400 mpn/100 ml
pH	Within the range of 6.0 to 9.0

Subcategory and section designation

Meat Cutter. 432.67.
Sausage and Luncheon Meats Processor. 432.77.
Ham Processor. 432.87.
Canned Meats Processor. 432.97.

Appendix A—Documents Used in the Analysis

The data for each of the industry categories were taken from the documents listed below:

1. Dairy Products

Dairy Products Processing. EPA 440/1-74-021-a.

2. Grain Mills

Grain Processing. EPA 440/1/74-028-a.
Animal Feed, Breakfast Cereal and Wheat Starch. EPA 440/1-74/030-a.
Corn Wet Milling. EPA 440/1-74/029-b, Supplement.

3. Fruits and Vegetables

Apple, Citrus and Potato Products. EPA 440/1-74-027-a.
Economic Analysis of the Fruits and Vegetables Category (Phase II). EPA 230/1-75-036. Supplement, April 1976.

4. Seafood

Fish Meal, Salmon, Bottom Fish, Clam, Oyster, Sardine, Scallop, Herring, and Abalone. EPA 440/1-75/041-a.
Catfish, Crab, Shrimp and Tuna. EPA 440/1-74-020-a.

5. Sugar Processing

Beet Sugar Processing. EPA 440/1-74-002-b.
Cane Sugar Processing. EPA 440/1-74-001-c.

6. Cement Manufacturing

Cement Manufacturing. EPA 440/1-74-002-a.

7. Feedlots

Feedlots. EPA 440/1-74/004-a.

8. Phosphate Manufacturing

Other Non-Fertilizer Phosphate Chemicals. EPA 440/1-75/043-a.

9. Ferroalloys

Smelting and Slag Processing. EPA 440/1-74/008-a.
Calcium Carbide. EPA 440/1-75/026.
Electrolytic Ferroalloys. EPA 440/1-75/026-a.

10. Glass Manufacturing

Pressed and Blown Glass. EPA 440/1-75/034-a.
Flat Glass. EPA 440/1-74/001-c.
Insulation Fiberglass. EPA 440/1-74-001-b.

11. Meat Products

Red Meat Processing. EPA 440/1-74-102-a.
Processor. EPA 440/1-74/031.
Independent Rendering. EPA 440/1-77/031-e, Supplement.

Appendix B—The Cost of Pollutant Removal By Publicly Owned Treatment Works

Background. In order to develop an effluent limitation which meets BCT requirements, Congress requires that the cost and level of reduction of conventional pollutants by industrial dischargers be compared with the cost and level of reduction to remove the same type of pollutants by publicly owned treatment works (POTW's). The POTW comparison figure has been calculated by evaluating the change in costs and removals between secondary treatment (30 mg/l BOD and 30 mg/l TSS) and advanced secondary treatment (10 mg/l BOD and 10 mg/l TSS). The difference in cost is divided by the difference in pounds of conventional pollutants removed, resulting in an estimate of the "dollar per pound" of pollutant removed.

The following details the specific calculation of this POTW cost figure. This involves four basic steps: first, the average size POTW is determined; second, the total annual costs for secondary and advanced secondary treatment are estimated; third, the pollutant removal of the systems is determined; fourth, the additional costs are divided by the additional pounds of pollutants removed.

All the costs have been indexed to third quarter 1976 dollars to make them comparable to the industry costs which are in September 1976 dollars. The specific indices used are presented in the discussion below. The POTW cost figure can be updated to current year dollars by use of these indices.

Average sized POTW. The POTW cost figure is based on the average flow size POTW for the Nation. This average size is calculated by dividing the total national daily flow of sewage by the number of POTW's in the country. There are 26,205 mgd of sewage discharged by 14,692 POTW's which results in an average size POTW of 2 mgd.[1]

Total annual POTW costs. The Agency based its estimates of annual POTW costs on information from two documents: The Construction Cost Document[2] and the O & M Cost Document[3] both issued by EPA's Office of Water Program Operations. These documents provide the most up-to-date information regarding the costs of constructing and operating POTW's.

[1] "1978 Survey of Needs, Conveyance and Treatment of Municipal Wastewater, Summaries of Technical Data," EPA 430/9-79-002, February 1979, at 9 and 12.

[2] "Construction Costs for Municipal Wastewater Treatment Plants: 1973-1977," EPA 430/9-77-013, January 1978 (hereinafter cited as "Construction Cost Document").

[3] "Analysis of Operations and Maintenance Costs for Municipal Wastewater Treatment Systems," EPA 430/9-77-015, May 1978 (hereinafter cited as "O & M Cost Document").

The POTW costs used in estimating the cost of pollutant removal are the total annual costs of upgrading a secondary treatment system to advanced secondary treatment (AST). This is done by estimating the total annual costs for a new advanced secondary treatment system and deducting the savings that are expected if secondary treatment is already in place. Total annual costs include capital charges and operations and maintenance expenses.

The annual capital cost for a new AST system is equal to:

[illegible] × [illegible]

[illegible]

BILLING CODE [illegible]

[illegible] is specifically calculated as follows.

(1) capital cost of AST [4] = $(3.5 \times 10^6)(Q^{.91})$, where Q is flow in mgd.

$= (3.5 \times 10^6)(2^{.91})$

= $6.61 million

(2) capital recovery factor [5] = 9.427, based on a 30 year amortization at a 10 percent interest rate.

(3) price deflator [6] = $\frac{\text{LCAT index, third quarter 1976}}{\text{LCAT index, first quarter 1978}}$

$= \frac{129}{143}$

= .902

(4) annual capital cost of AST = $\frac{\text{capital costs of AST}}{\text{capital recovery factor}}$ x price deflator.

$= \frac{\$6.61 \text{ million}}{9.427} \times .902$

= $.633 million a year

The annual savings from having secondary treatment in-place are equal to:

$\frac{\text{capital savings of in-place secondary}}{\text{capital recovery factor}}$ x price deflator

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4 Construction Cost Document. Supra note 2, Figure 7.1, curve 2.

5 Management Accounting, Robert Anthony and James Reece, June 1975, Appendix Tables, Table 5 (hereinafter cited as "Management Accounting").

6 "Construction Cost Index Quarterly Recap," Office of Water Program Operations, EPA, first quarter 1976 et seq (hereinafter cited as "Construction Cost Index")

This is specifically calculated as follows.

(1) capital savings of in-place secondary[7] = $(2.145 \times 10^6)(Q^{.89})$, where Q is flow in mgd

$= (2.145 \times 10^6)(2^{.89})$

= $3.98 million

(2) capital recovery factor[8] = 9.427, based on a 30 year amortization at a 10 percent interest rate.

(3) price deflator[9] = $\frac{\text{SCCT index, third quarter 1976}}{\text{SCCT index, first quarter 1978}}$

$= \frac{119}{132}$

= .902

(4) annual capital savings of in-place secondary = $\frac{\text{capital savings of in-place secondary}}{\text{capital recovery factor}} \times \text{price deflator}$

$= \frac{\$3.98 \text{ million}}{9.427} \times .902$

= $.381 million a year.

The O&M costs for an AST are equal to: O&M cost for AST x price deflator.

This is specifically calculated as follows.

(1) O&M cost[10] = $(6.85 \times 10^4)(Q^{1.44})$, where Q is flow in mgd

$= (6.85 \times 10^4)(2^{1.44})$

= $.185 million a year

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7 Construction Cost Document. Supra note 2, Figure 7.1, curve B.

8 Management Accounting, Supra note 5, Appendix Tables, Table B.

9 Construction Cost Index, Supra note 6.

10 O&M Cost Document, Supra note 3, Figure E. 2-4.

(2) price deflator [11] = $\frac{\text{O\&M index third quarter 1976}}{\text{O\&M index, first quarter 1978}}$

$= \frac{206}{230}$

$= .896$

(3) O&M for an AST = O&M cost x price deflator

= $.186 million a year x .896

= .167 million a year

The O&M costs for secondary treatment are equal to:

O&M cost for secondary treatment x price deflator.

This is specifically calculated as follows.

(1) O&M cost [12] = $(8.25 \times 10^4)(Q^{.96})$, where Q is flow in mgd.

$= (8.25 \times 10^4)(2^{.96})$

= $.160 million a year

(2) price deflator [13] = $\frac{\text{O\&M index, third quarter 1976}}{\text{O\&M index, first quarter 1978}}$

$= \frac{206}{230}$

$= .896$

(3) O&M for secondary treatment = O&M cost x price deflator

= $.160 million a year x .896

= $.143 million a year

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11 "O&M Cost Index Quarterly Recap," Office of Water Program Operations, EPA, first quarter 1976 et seq (hereinafter cited as "O&M Cost Index").

12 O&M Cost Document, Supra note 3, Figure E. 2-3.

13 O&M Cost Index, Supra note 11.

The incremental total annual cost of upgrading in-place secondary treatment to AST is equal to:

(annual capital cost of new AST + O&M for AST) -

(annual capital savings of having in-place secondary treatment + O&M for secondary treatment).

This is specifically calculated as follows, using the results of the previous calculations.

Incremental total annual cost = ($.633 million a year + $.167 million a year) ($.381 million a year + $.143 million a year)

= ($.800 million a year)-($.524 million a year)

= $.276 million a year

Pollutant Removal by POTWs. The other half of calculating the cost per pound of pollutant removed requires the determination of the number of pounds of conventional pollutants removed by advanced secondary treatment beyond secondary treatment. The pounds of pollutants removed equal the flow of the POTW times the change in concentrations of the pollutants as they pass through the system. For the calculations presented here the influent concentration is 210 mg/l for BOD and 230 mg/l for TSS.[14] For a 2 mgd POTW that treats BOD to 30 mg/l and TSS to 30 mg/l the pounds of BOD and TSS removal equal:

= flow x change in concentration

$$= \frac{(2 \text{ million gallons})}{\text{day}} \times \frac{((210 + 230) - (30 + 30))\text{mg}}{\text{liter}}$$

$$= \frac{(2 \text{ million gallons})}{\text{day}} \times \frac{(380)\text{ mg}}{\text{liter}}$$

$$= \frac{(2 \text{ million gallons})}{\text{day}} \times \frac{(380 \text{ mg})}{\text{liter}} \times \frac{(365 \text{ days})}{\text{year}} \times \frac{(3.785 \text{ l})}{\text{gallon}} \times \frac{(1 \text{ lb})}{454{,}000 \text{ mg}}$$

= 2.31 million pounds of BOD and TSS removed per year.

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[14] "Areawide Assessment Procedures Manual, Appendix H, Point Source Control Alternatives," EPA Laboratories, Cincinnati, Ohio, at H-14.

For an advanced secondary treatment plant that treats to 10 mg/l BOD and 10 mg/l TSS the removal is:

$$= \frac{(2 \text{ million gallons})}{\text{day}} \times \frac{(210 + 220) - (10 + 10)\text{ mg}}{\text{liter}}$$

$$= \frac{(2 \text{ million gallons})}{\text{day}} \times \frac{(420)\text{mg}}{\text{liter}} \times \frac{(365 \text{ days})}{\text{year}} \times \frac{(3.785 \text{ l})}{\text{gallon}} \times \frac{(1 \text{ lb})}{454{,}000 \text{ mg}}$$

= 2.55 million pounds a year

The incremental removal equals (2.55 million pounds a year) - (2.31 million pounds a year) = .24 million pounds a year.

The effluent characteristics of 30 mg/l BOD and 30 mg/l TSS for secondary treatment were selected, because this is the legal requirement for POTWs as established by EPA. Effluent characteristics of 10 mg/l BOD and 10 mg/l TSS for advanced secondary treatment are used since they represent the best performance for advanced secondary treatment. Using the best recognized performance gives the POTWs credit for removing the most pollutants and therefore tends to bias the per pound cost of pollutant removal downward. This will result in the greatest possible relief for industries. Appendix D discusses this in additional detail. Both the 30 mg/l and the 10 mg/l performance levels correspond to the maximum 30-day average performance of the POTW.

Incremental Cost of Removal. To calculate the cost of pollutant removal of upgrading secondary treatment to advanced secondary treatment, the additional costs must be divided by the additional removal of BOD and TSS. Specifically the calculation is:

$$= \frac{\text{incremental total annual costs}}{\text{incremental annual pollutant removal}}$$

$$= \frac{\$.276 \text{ million a year}}{.24 \text{ million pounds a year}}$$

= $1.15 a pound

This cost is indexed for various time periods below:

Cost of Pollutant Removal

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1976	$1.10	$1.14	$1.15	$1.17
1977	$1.18	$1.20	$1.25	$1.26
1978	$1.27	$1.30	$1.34	$1.41

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Subcategories of Secondary Industries* for
Which BCT is Likely to Equal BPT

Point Source Category	CFR Number	Subcategory Name
Dairy Products Processing	405.1	Receiving Stations
	405.6	Natural Processed Cheese
Grain Mills	406.4	Bulgur Wheat
Canned and Preserved Fruits and Vegetables	407.1	Apple Juice (small plants)
	407.2	Apple Products (small plants)
Cement Manufacturing	411.1	Non-leaching
	411.2	Leaching
Feedlots	412.2	Duck Feedlots
Glass Manufacturing	426.5	Float
	426.6	Auto Tempering
	426.7	Auto Laminating
	426.8	Container
	426.10	Tubing
	426.11	TV Picture Tube
	426.12	Incandescent Lamp
	426.13	Hand Pressed and Blown

* Source: Tentative determinations by Effluent Guidelines Division on November 21, 1979.